12. A controller for controlling an actuator of an exoskeleton, the controller comprising:

a processor; and

a computer-readable storage medium storing computer program modules executable on the processor, the modules configured for:

receiving a desired mechanical impedance function of the exoskeleton, the desired mechanical impedance function comprising a desired relationship between forces applied to the exoskeleton and resulting angular velocities of the exoskeleton at various frequencies;

receiving a measured angular velocity of a limb segment of a user wearing the exoskeleton; and

controlling a force of the actuator based on the measured angular velocity using impedance control to implement the desired mechanical impedance function of the exoskeleton,

the desired mechanical impedance function of the exoskeleton being an active impedance function that causes the exoskeleton to be assistive to the user wearing the exoskeleton by reducing a muscle torque required to move the limb segment, the desired mechanical impedance function comprising a negative exoskeleton impedance component, wherein the negative exoskeleton impedance component is determined by estimating a limb impedance component of the limb segment of the user and by negatively scaling the estimated limb impedance component based on a degree of reduction of the muscle torque required to move the limb segment.

13. The controller of claim 12, wherein the negative exoskeleton impedance component comprises one from the set of: a negative desired inertia moment of the exoskeleton, a negative desired damping of the exoskeleton, and a negative desired stiffness of the exoskeleton.

14. The controller of claim 13, wherein the negative exoskeleton impedance component is out of phase with a limb impedance component of the limb segment of the user by 180 degrees.

* * * * *